

SCIENCE.

FRIDAY, FEBRUARY 19, 1886.

COMMENT AND CRITICISM.

MR. J. SCOTT KELTIE'S REPORT (Supplementary papers, Royal geographical society, part iv.), as inspector of geographical education, should be read by all who are interested in the cause of sound education. As to England, he says the situation of geographical education is best summed up in the words of an educational authority, whose name is not given : (1) "In universities it is *nil* ; (2) in public schools, very nearly *nil* ; and when it is attempted, it is given to the most incompetent master, and he has a wretched set of maps ; (3) it is required for the public services, and taught, I do not know how, by crammers ; (4) the only places where geography is systematically taught in England are the training colleges and the board-schools, with now, and for the last few years, some few good high and middle-class schools." This is due mainly to the fact that the study of geography does not 'pay.' There is no demand for high-grade teachers, as there are no professors or readers of geography in the universities. It has no real place in the examinations upon which so much depends in England, and therefore the teachers in some of the best schools actually advise their pupils not to study geography. How different in Germany, in France, and even in Spain ! Considering the candid way in which the inspector has spoken of the English schools, it is perhaps fortunate that our worthy ex-commissioner of education was unable to furnish him with any information concerning the study of geography in American schools.

As a part of his duty, Mr. Kelsie made a collection of appliances used in geographical education throughout the world. These were placed on exhibition, and a catalogue issued. Here, again, the Germans led, as, indeed, one who has used Stanford's and Reimer's maps side by side in the class-room would have expected. In his explorations for such material, the inspector had many strange experiences ; as, for instance, at one of the oldest and most celebrated English public schools he

found only two maps, — "one a large map of the Dominion of Canada, presented by the high commissioner, ornamenting one of the passages ; and another wretched school wall-map, exhumed, after much searching, from a remote recess." In contrast to this, he prints a list of the appliances used in teaching geography in the Frankfort Wöhler-schule, and in other German schools. In the above-named school there are in actual use one hundred and seven maps, pictures, models, and atlases. The exhibition was designed to illustrate the actual condition of things ; "and, therefore, in all classes," according to Mr. Keltie, "will be found objects which may be taken as examples of 'how not to do it.'" Most of these were of English make. It is a curious commentary on our own methods, and especially on our publishers of educational works, that of the 305 maps, globes, models, relief-maps, etc., not one came from this side of the Atlantic. There were 163 atlases, but not a single atlas bore the imprint of an American publisher. Among the 229 text-books, only three — Miss Hale's 'Methods of teaching geography,' Hopkins's 'Handbook of the earth,' and Swinton's 'Complete course' — were of American manufacture. And on the whole the exhibition was not one of which either Englishmen or Americans should be proud.

SCIENCE AND THE STATE is the subject of a recent article by Dr. Shufeldt in *Mind in nature*, wherein he makes some very pertinent criticisms upon the heterogeneous condition of the national scientific work and the desirability of its greater unification. He proposes a scheme whereby this may be effected ; viz., that a department of science should be created by congress, the head of which should be a cabinet officer, to be designated as the secretary of science, and to be chosen from the National academy of sciences ; that this department should be divided into eleven bureaus, — agriculture, biology, chemistry, education, ethnology, geology, geodesy and surveying, meteorology, military and civil engineering, sanitary science, and industry ; and that all appointments should be made by the National academy of sciences, and approved by the president of the United States. For the accommodation of

this department of science, he would have a large building erected, and liberal appropriations made. We doubt the entire feasibility of such a scheme. In the first place, to restrict the president in the choice of members of his cabinet to any given body of men, no matter how eminent that body may be, is simply out of the question; nor would this restriction be desirable. Members of the National academy are such because they are eminent specialists, and a specialist should be the last to control a department of this kind. Dr. Shufeldt also proposes, that commissioned army and navy officers who show scientific abilities should be encouraged and provided for by the government: this, too, has certain objections. Why the United States should hold out inducements to its commissioned officers to abandon the duties for which they were appointed, one cannot see. A surgeon or lieutenant of artillery has certain specific duties for which he enjoys a salary and future competency. By all means, he should be encouraged to excel in those duties, and he should not be discouraged in any other commendable work that he may undertake without detriment to them; but should government hold out direct reasons for him to become an archeologist, a philologist, a naturalist, or a physicist? Are army officers government wards, or government servants? and why should they have greater inducements to become Sanscrit scholars, chemists, and comparative anatomists, than the general public?

THE GREAT COST of elaborate printed catalogues, in which many of our wealthier libraries are now indulging, suggests the desirability of a scheme of co-operative cataloguing, which is stated at some length in this week's number of *The nation*, by Mr. Fletcher, the librarian at Amherst. He calls attention to the fact that nearly all our considerable libraries are making, or keeping up, elaborate catalogues, which are, to a large extent, repetitions of one another. As the suggestion of an experienced librarian, we incline to attach considerable significance to his saying that a very large share of the present cataloguing expense borne by these libraries is "wasted in the reduplication of that which ought to be done once for all. . . . Already this system of elaborate cataloguing, repeating itself in scores, even hundreds, of libraries, is breaking down of its own weight." Mr. Fletcher regards co-operation as furnishing the only

solution of this important question, — a solution, too, "capable of meeting the needs of the twentieth century, when our libraries will be numbered by thousands, and the volumes in scores of them by millions. . . . The time must soon come when the libraries will no longer undertake to provide subject catalogues of their own. The author catalogues will necessarily be kept up, as each library must have a list of its books. But in place of the subject catalogues we shall have printed bibliographies of subjects, issued, for the most part, periodically, and serving equally for one library or another." These bibliographies may often indicate which libraries contain the rarer publications, on the plan admirably executed in Dr. Bolton's list of scientific periodicals, lately issued by the Smithsonian institution. Such a scheme of bibliographies and subject-indexes is unquestionably feasible, and Mr. Fletcher thinks it furnishes the only possible solution of the problem. It is to be hoped that the directors of our public and college libraries will show themselves ready to co-operate in whatever manner the co-operation committee of the American library association, of which Mr. Fletcher is the chairman, may decide upon. The committee invite any suggestions which may assist in forwarding the proposed reform.

THE LEADING SPIRITS of the theosophical society are evidently undismayed by the testimony against their honesty and candor, as adduced in the investigation carried on under the auspices of the English society for psychical research. A protest is now commenced against the conclusions of that investigation, prepared by A. P. Sinnett and Madame Blavatsky. The report of the psychical research society was noticed in *Science* (vol. vii. p. 81); and any effectual protest against conclusions so clear and decided as those of that report must be accompanied by the strongest evidence possible.

PROGRESS IN INDIA.

THE possibility of any national movement among the natives of India, looking toward state organization and self-government, has scarcely ever been accepted by her rulers and other civilized nations. Recent developments, however, seem to indicate that the Indian capacity has been underrated. A correspondent of the *London Times* states that the Bombay leaders have lately

given proof of their organizing power. They brought together a national congress composed of delegates from every political society of any importance throughout the country. Seventy-one members met together; twenty-nine great districts sent spokesmen. The whole of India was represented, from Madras to Lahore, from Bombay to Calcutta.

For the first time, perhaps, since the world began, India as a nation met together. Its congeries of races, its diversity of castes, all seemed to find common ground in their political aspirations. Only one great race was conspicuous by its absence; the Mohammedans of India were not there. They remained steadfast in their habitual separation. They certainly do not yield to either Hindoo or Parsee in their capacity for development, but they persistently refuse to act in common with the rest of the Indian subjects. Not only in their religion, but in their schools, and almost all their colleges, and all their daily life, they maintain an almost haughty reserve. The reason is not hard to find. They cannot forget that less than two centuries ago they were the dominant race, while their present rivals in progress only counted as so many millions of tax-paying units who contributed each his mite to swell the glory of Islam.

But in spite of the absence of the followers of the prophet, this was a great representative meeting. The delegates were mostly lawyers, schoolmasters, and newspaper editors, but there were some notable exceptions. Even supposing these three professions alone provided the delegates, the meeting would fairly represent the education and intellectual power of India. Not a word was said of social reform; all they discussed, and all they demanded, was political power and political changes; a tone of most absolute loyalty pervaded all the proceedings. Education and material prosperity, order, security, and good government, were all incidentally mentioned as causes of gratitude towards the present rulers. But such allusions were only by the way. Every desire was concentrated on political advancement and an immense increase of the share at present given to the natives of India in the government of their own country. The question of their ability to govern themselves was never even touched upon by the wisest of the speakers. Though there was much crude talk, much of that haste which only makes delay, and that ignorance which demands premature concessions, and too implicit reliance upon legislative powers, there was also much of most noble aspiration, and a sense of patriotism and national unity, which is a new departure in the races of the east.

PREJEVALSKY'S EXPLORATIONS IN MONGOLIA.

THE renowned traveller and explorer, Colonel Prejevalsky, to whom a reference is made in our St. Petersburg letter, arrived there on his return journey from Mongolia, the earlier part of the present month. A correspondent of the *London Times* says that this expedition of Colonel Prejevalsky, lasting two years, and costing over 43,000 roubles of government money, has been the most remarkable one ever undertaken in the wilds of Mongolia and Tibet. The intrepid explorer, as his published letters have already shown, literally fought his way into these inhospitable regions, at the head of a well-armed party of thirteen Cossacks, four grenadiers, and a host of other attendants; and, as he stated at Moscow, more than one hundred natives, who at different times waylaid the explorers, were made to feel the deadly effects of the Berdan rifle-fire. The exact numbers of the killed and wounded were stated in the extremely interesting letters addressed to the Grand Duke, at various stages of the journey. This is scientific exploration with a vengeance, and goes beyond any thing that Mr. Stanley did with his 'six-shooter' among the negroes of Africa.

In the last of the above-mentioned series of letters, the colonel also expressed the ardent wish of the Mongolian natives to be taken under Russian protection, and shielded from Chinese oppression. The same idea he has again impressed upon his friends, in answer to their many inquiries, as they greeted the tall, sun-burnt traveller. The *Viedomosti*, referring to this, says, "Among the natives visited by Colonel Prejevalsky there exists a deep conviction that sooner or later the 'great white czar' will enter their country and take them under his domination. At one place the explorer showed a portrait of the emperor to one of the natives, who went into raptures over it, and soon large crowds of inhabitants, with women and children from the neighboring districts, gathered round the colonel and implored him to show them the likeness of the 'white czar.'"

The regions visited by Colonel Prejevalsky are generally supposed to be, nominally at least, within the dominions of the emperor of China. No wonder, therefore, that rumors of a protest have come from Peking. The grenadiers who accompanied the expedition have been promoted, and, besides receiving pecuniary gratifications, have had their portraits distributed throughout the regiment. Colonel Prejevalsky has given a number of Russian names to newly-discovered places, such as the 'Moscow-Chain,' the 'Kremlin

Rock,' and the 'Czar-liberator's Mountain.' One hundred and fifty photographs and sketches were taken, and a large number of geological and other specimens were collected. The expedition will no doubt have important scientific, and perhaps other results.

THE U. S. GEOLOGICAL SURVEY.¹

THE plan of this volume is the same as that of its predecessors, comprising, first, the summary report of the director; second, brief administrative reports of the chiefs of divisions on the work accomplished in the several departments of the survey, with brief itineraries of the field-parties; and, third, the accompanying papers, which make up the main part of the volume, and are the only feature of permanent interest or value. These papers are the monographs or final reports finished during the year. The longer monographs appear here in abstract form only, being, like the more fragmentary bulletins, published separately for the use of specialists. But, although the annual volume is not a perfect *résumé* of the survey, it is wisely designed to present all the results of interest to the general reader.

The principal feature of Major Powell's summary report for 1882-83 is the preliminary statement of the proposed topographical and geological map of the United States, with the accompanying map showing the, for the most part, very limited areas which have been surveyed under the authority of the various states and of the general government, on a scale suitable for the present purpose. The scale adopted for the proposed map is 1:250,000, or about four miles to the inch, with contour lines for every twenty-five to two hundred feet, according to the character of the topography. It is proposed to publish this general map in atlas sheets, each being composed of one degree of longitude by one of latitude, in areas bounded by parallels and meridians.

Although the administrative reports indicate a larger amount of topographic and geologic work than for any previous year, the published results are comparatively meagre, the monographic portion of this volume falling decidedly below the average in extent, if not in general interest. The most important paper has only an indirect relation to the geology of the United States. This is Captain Dutton's able memoir on the volcanoes of the Hawaiian Islands. This work was not done at the expense of the survey, nor in anticipation of the annexation of the island kingdom to this

country, but simply as a preparation for the study of the gigantic lava-flows of the Cascade Range in northern California and Oregon, — a work upon which Captain Dutton has since been engaged. Hence criticism of the survey for extending its operations beyond its legitimate field is forestalled, and the publication of this valuable contribution to our knowledge of the noblest of living volcanoes will undoubtedly be justified by the light which it will throw upon the volcanic phenomena of our north-western territories; for, while these are unparalleled among the eruptions of historic times, the evident liquidity and the vast volume of the lava plainly suggest the stupendous flows of Hawaii as the proper preparatory field of the student who would bring to their investigation the best comparisons that modern volcanism affords.

It is impossible here to do justice to the graphic descriptive chapters, which fully sustain the reputation achieved by the author for the bold and discriminating portrayal of geologic phenomena, in his reports on the plateau country and the Grand Cañon. But the highly important and original chapter on the volcanic problem may not be disposed of so summarily. Captain Dutton has here gathered together the principal facts and conclusions reached in his study of Mauna Loa and Kilauea, with a view to ascertaining whether they shed any new light upon the dark problem of the volcano. He goes to the root of the matter at once by calling attention to the fact that the volcano is essentially a heat problem, and that the final solution to be sought is an explanation of the origin of this heat and its modes of action.

The universal postulate that the earth's interior is throughout in a state of incandescence is accepted as a matter of course; but the question as to whether it is mainly liquid or solid is regarded as still in abeyance, and the determination of this point is not considered essential to the discussion of the volcanic problem. Against the view that the penetration of water to the seat of the internal fires is the cause of volcanic action, two objections are urged. 1°. The access of cold water would cool, and probably solidify, the lava. It might be claimed on the other side, however, that the water must be itself very hot before it reaches the lava, and that aqueo-igneous liquefaction takes place at much lower temperatures than dry fusion. The vaporization of the water would, however, absorb a large amount of heat. 2°. But this last consideration is rendered unimportant by the second objection; viz., that liquid water cannot pass the isotherm of 772° F. (the temperature of its critical point), and hence must be vaporized long before it reaches the lava.

That aqueous vapor may penetrate to the reser-

¹ *Fourth annual report of the U. S. geological survey to the secretary of the interior (1882-83)*. By J. W. POWELL. Washington, Government, 1884. 8°.

voirs of liquid rock and be absorbed by it, as any gas would be by a liquid, is regarded as entirely possible, and not improbable. But great emphasis is properly laid upon the fact that this gradual absorption of hot vapor by hot lava would not create any tendency in the lava to explode or erupt, unless accompanied by a diminution of pressure or increase of temperature; and it is demonstrated at considerable length that no changes of temperature or pressure in the magma, of sufficient magnitude to merit consideration, are possible: consequently the balance of probability is regarded as inclining decidedly against the hypothesis that water is the cause of volcanic action. It does not appear, however, that Captain Dutton has taken any account of the important consideration, that, by the rising of the isogeotherms, water-impregnated portions of the earth's crust may conceivably attain a high degree of liquidity and expansive force; i. e., be made eruptible.

The hypothesis that volcanic energy is due to the penetration of oxygen to the unoxidized earth-matter below the crust is also rejected, mainly because it appears to be insusceptible of proof or disproof, postulating conditions beyond the reach of argument, but partly on account of the difficulty of finding a sufficient amount of oxygen. The statement, however, that some naturalists *imagine* that the earth's interior is imperfectly oxidized is certainly unwarranted, in view of the fact that basic lavas contain metallic iron and a vast amount of iron in a low state of oxidation.

Mallet's theory, that volcanic heat results from the mechanical crushing of the rocks when the crust yields to the powerful horizontal pressure due to the cooling of the interior, and mountain-ranges, rock-folds, and faults are produced, shares the same fate; chiefly because it is now probable that the cooling of the earth has been up to this time comparatively superficial, the infra-crustal regions being still as hot as ever. But Captain Dutton's argument is not conclusive, since he has simply shown that the corrugation of the crust must be ascribed to some other cause, such as the diminution of the earth's oblateness in consequence of the retardation of its rotation by tidal friction. The corrugation itself is an unquestioned fact, and, however produced, must have been attended by an enormous development of heat.

The fourth hypothesis examined assumes a local development of heat in the earth by unknown causes. This cuts the Gordian knot instead of untying it, but is rejected because its conditions preclude all discussions of its validity or adequacy. Relief of pressure would greatly promote the liquefaction and elastic expansion of lavas; but

this is unconditionally rejected as a cause of eruptions, since denudation, the only cause of diminished pressure which Captain Dutton recognizes, cannot be correlated in its distribution with active volcanoes.

Having thus discredited all hypotheses of the origin of volcanic heat heretofore proposed, Captain Dutton advances no new view, but coolly demolishes our hope with the statement that Mauna Loa and Kilauea do not throw any more light upon the general problem than other volcanoes. He proceeds to show, however, that in other directions they have contributed something to our knowledge of volcanism. They are at once the largest and most active of volcanoes, activity being measured by the outflow of lava, and dissipation of energy. They agree with active volcanoes in general in standing on an area of elevation. That Hawaii has risen nearly three thousand feet in comparatively recent times, is regarded as clearly proved by the elevated beaches and terraces. The problem of the causes of elevatory movements is then attacked, and the numerous hypotheses are reduced to two alternative propositions; viz., the elevated portion of the earth has experienced an increase of matter, or it has undergone expansion. While local increments of mass are not ignored, the expansion hypothesis is accepted as the one agreeing best with the observed facts; and the tangential thrusts of the earth's crust are definitively rejected as a primary cause of vertical movements. Our author wisely refrains, however, from estimating what proportion of the altitude of the Alps and other mountain-ranges is due to the crumpling of their strata; this crumpling being unquestionably due to horizontal thrusts, and amounting in the Alps, according to Heim, to seventy-four horizontal miles. Hawaii, we are told, floats high because of the lightness of this part of the earth's crust, its relatively low density being due in part to its high temperature, and in part to the porosity of the lava, and the numerous and often large tunnels by which the entire island appears to be honeycombed. But no calculation is given of the increase of temperature required in a thin crust, with a reasonable coefficient of expansion, to produce an elevation of two or three miles in a non-volcanic region. It is not easy to see how the expansion hypothesis can survive application to really important instances of elevation.

Captain Dutton regards the Hawaiian volcanoes as immense columns of liquid lava with their accumulated overflows; and the upper ends of these columns, whether frozen over or exposing fiery lakes to the sky, are believed to be fundamentally unlike the craters of ordinary volcanoes. The

term 'caldera' is proposed and used as a general name for volcanic orifices of the Hawaiian type. As the column of lava gradually melts away the enclosing rocks, the caldera is enlarged by the falling-in of the surface, and it is not in any case due to explosions. Mauna Loa and Kilauea are clearly independent volcanoes; and we have no reliable indications that their activity is diminishing. The vast antiquity of the Hawaiian volcanoes is plainly shown, not only by their magnitude, but also by the wonderful progress of the agents of erosion, especially in those islands where the volcanic fires are now extinct. This is one of the principal topics discussed in the chapters on Maui and Oahu.

The abstract of the report by Mr. J. S. Curtis on the mining geology of the Eureka district, Nevada, supplements that by Mr. Arnold Hague on the general geology of the same district in the preceding volume. It is accompanied by sections of the principal workings, and discusses exhaustively the characteristics and probable origin of these singular ore-deposits, which had yielded sixty millions of dollars up to the close of 1882.

Following this is a short but useful chapter on popular fallacies regarding precious metal ore-deposits by Mr. Albert Williams, jun. Dr. C. A. White's review of the Ostreidae of North America, with an appendix by Mr. Heilprin, and thirty-eight plates, describes in simple yet scientific language all the known fossil species and the single living species of the Atlantic coast. A second appendix by Mr. Ryder, with eleven plates, is devoted to an interesting sketch of the life-history of the oyster.

The volume concludes with Mr. I. C. Russell's geological reconnaissance in southern Oregon, with two maps and sixteen small sections. This is a short but highly interesting account of the extreme northern part of the Great Basin, which is shown to possess the same structural and climatic features as the basin of Lake Lahontan, which bounds it on the south, and was described by the author in the annual report for 1881-82.

GEOGRAPHICAL NOTES.

Missionary maps.—The establishments of Les missions catholiques at Lyon, France, have issued an atlas containing data collected by the Catholic missionaries in various parts of the world. Beside the general maps, which resemble those of any good elementary atlas, there are some thirty detailed maps which have appeared from time to time in the organ of the missionary bodies. Numerous important additions to geography have been made by the missionaries; and, in bringing

them together in convenient form, the atlas meets a real need. They appeared first in German, with explanatory text by Father O. Werner, and have been translated into French, with additions, by Valerien Groffier.

A newly discovered affluent of the Kongo.—The despatches from the Cape of Good Hope state that the expedition under Lieutenant Wissmann has discovered a new affluent of the Kongo, which will have an important bearing on the opening-up of the lower Kongo basin. Wissmann is on his way to Europe with the details. The new river is a powerful stream, over five hundred miles in length, between the equator and Stanley Pool. It is eight miles wide at its mouth, and quite deep. There were no obstacles to its navigation and the Pogge Falls, in the Tapende country, latitude 6° south, and longitude 22° east. Lake Lincoln, to be found on some charts, does not exist: the only lake encountered was Lake Leopold II., near the Kongo. The journey was made in large canoes constructed by the expedition, and a way was forced through the territory of savage cannibal tribes, who, if armed with guns instead of arrows, would have prevented their passage. In a single day as many as five conflicts took place, and several of the party were wounded, though none were killed. The journey was accomplished by Lieutenants Wissmann and Müller, a physician, artificer, and forty-six natives. The ferocity of the natives is accounted for by the fact that they had never seen white men or fire-arms. More details will soon be accessible. Meanwhile it seems more likely that the river is one of those which have been known only by report, rather than an entirely new discovery. The country is reported to be fertile, producing palm-oil, sugarcane, rice, and other tropical products.

Explorations in Central South America.—De Brettes sends a short note on his recent travels in the unexplored part of the southern district of the Gran Chaco, which began last March, and lasted forty-four days. He discovered a large salt lake (along which his party travelled nine days, and the west shore of which is estimated to be one hundred and thirteen miles long), also three rivers, running in a northerly direction, supposed to be tributaries of the Rio Vermejo. The south Chaco is flat, covered with thorns, mimosas, and tall herbage. The natives are hypocritical and cruel, and live in utter barbarism. After penetrating two hundred and twenty miles into the unknown region, the explorers were obliged by fever to retrace their steps to Corrientes. A new expedition was in contemplation.

Restoration of Lake Moeris.—The investigations of Mr. Cope Whitehouse in regard to the

site of the ancient Lake Moeris in Egypt have been so fruitful that the Egyptian government has taken the matter in hand, and it is believed, that, by a small expenditure, the surplus waters of Bahr Yussef can be directed into the now dry depression. Preliminary surveys are in progress to determine the practicability and expense of restoring a state of things very exactly described by Herodotus, Strabo, and Pliny, as having existed in past ages.

Ancient Arabic inscription in the Sahara.—Le Chatelier furnishes an account of what may prove to be an important inscription in an artificial cavern at Timissao, near the wells and on the right bank of the wady of the same name, in the Sahara. The wady, coming from the south, turns here toward the west. Its banks are of conglomerate, in two horizontal beds, separated by a bed of gray schist in vertical layers. These schists have been dug out for a distance of over two hundred feet, forming a sort of gallery fifteen feet wide and six or seven feet high. The inner wall of the gallery is occupied by an inscription in Tifinakh lettering, the characters incised, and painted with red ochre. A more modern inscription in Arabic is simply painted on the roof. At the further end are some archaic incised figures on the wall, including those of five horses. The accounts seem to be truthful, though derived from the natives; and, if so, the deciphering of the inscriptions would be of great interest.

ASTRONOMICAL NOTES.

Eclipse of the sun, 1886, Aug. 28-29.—A bill has been introduced in congress, by Mr. Thomas of Illinois, to enable the secretary of the navy to fit out an expedition to observe the total eclipse of the sun which occurs on the 29th of August next. The sum of ten thousand dollars is appropriated for defraying the expenses of the expedition; and the secretary is authorized to detail a naval vessel to transport the party to a point near Benguela, on the west coast of Africa, almost the only seaport which is near the central line of totality. The bill was introduced in the house of representatives on the 11th of January, but has not yet come up for consideration. A similar bill introduced in the senate has been favorably reported by the committee on naval affairs. It will be remembered that this eclipse is of rather more than ordinary interest on account of the long duration of totality, — 4^m 41^s near Benguela. Another interesting circumstance has been noticed by Dr. Herz of Vienna, in the fact that at totality two stars, 47 ρ Leonis and 49 Leonis, are close to the sun, the latter within the corona. It is suggested, that, by

means of measurements upon these two stars, something may be learned in regard to the refracting power of this peculiar atmosphere of the sun. The total phase will be visible in the West Indies; but the sun will not be in a good position for observation. According to *Nature*, at Carriacou, the largest of the Grenadine Islands, totality commences at 19^h 11^m 45^s local mean time, and lasts 3^m 21^s; the sun's altitude being 20°.

Comet 1886 . . . (Barnard).—According to an ephemeris published by Mr. H. V. Egbert of the Dudley observatory, we may look for this comet to become quite a bright object during the early morning-hours in the latter part of May. Mr. Egbert's calculation shows that the comet on the 20th of May will be 360 times as bright as it was when discovered by Mr. Barnard, Dec. 3. Its position will be R. A., 2^h 53^m; decl., + 20° 26'; that is, it will appear above our horizon about an hour before the sun.

ST. PETERSBURG LETTER.

THE last number (9) of the Journal of the Russian physico-chemical society contains an elaborate paper, by K. Kraewitch, on the relation between the elasticity and density of the air in a rarified condition. His experiments on the velocity of sound show, that at a temperature of 17.5° C., the velocity decreased from 330 metres, at a pressure of 761 millimetres, to 171 metres, at a pressure of 2.6 millimetres. At a pressure of 280 millimetres, the velocity is about the same as the mean air pressure; but it diminishes rapidly below 280 millimetres. He concluded that gases below this pressure do not obey the Boyle-Mariotte law.

At the general meeting of the physico-chemical society in December, the coming eclipse of Aug. 18, 1887, was discussed. Prof. S. P. Glasenap showed a map on which the path of the total eclipse was marked. As it traverses an immense extent of Russia from Kiev to south-eastern Transbaikalia, and appears also on the shores of the great ocean at Possiet harbor, and as a total eclipse will not appear in Russia for thirty-six years after 1887, he concluded that the best use should be made of the opportunities offered by the eclipse to study different problems relating to solar physics. Prof. N. G. Egoroff followed with a communication on the corona and the opportunities offered by the eclipse for its study. The last paper was by Prof. A. Woeikof, on the meteorological side of the question. Observations on the amount of cloud prevalent in the region show a cloudiness of about 51; that is, half the sky is

clouded on the average, from the western part of the totality to Lake Baikal, the region on both sides of the Ural Mountains excepted, where it is above 6. Probably the conditions will be a little better than those indicated, as the eclipse will take place in the later morning hours, when cloudiness is somewhat less than in early morning and the afternoon. In southern Transbaikalia the cloudiness is even less. There is no doubt, according to Woeikof, that, if the observing parties are well distributed on the path of the eclipse, some of them will certainly have good atmospherical conditions, it being impossible that the sky be everywhere overcast on so extensive a territory. The great interest of barometric observations during the eclipse was then dwelt on, and the subject illustrated by the results of the American expedition to the Caroline Islands. The results would be especially important as bearing on the theory of the daily variation of air pressure.

At the annual meeting of the Academy of sciences, Jan. 10, the most interesting feature was a report on the progress and future prospects of the expedition to the New Siberian Islands under Dr. Bunge. It was to begin with an exploration of the Yana Basin. Among other matters, some results of last year's observations at Werkhojansk were mentioned. The mean temperature of January, 1885, was $-52^{\circ}.7$ C. ($-62^{\circ}.9$ F.) and the minimum -68° C. ($-90^{\circ}.4$ F.). Thus the low mean winter temperature at this place is more than confirmed by new and reliable observations, and it has the coldest winter weather yet known on our globe.

Colonel Prejevalsky has not yet arrived at St. Petersburg. He is to lecture at Moscow to-day on his last travels.

The annual meeting of the geographical society was held to-day. It was principally devoted to a review of the year's work of the society by the secretary. The annual awards followed. The highest, the Constantine medal, was awarded to N. D. Jurgens, the chief of the Russian Lena expedition. The Lütke medal was awarded to Colonel Pewtsow for his extensive travels and explorations in Mongolia; the great medal of the section of statistics, to Terestchenko, for his statistical description of several districts of the government of Poltava; the great medal of the ethnographical section, to Dmitrowsky, for his translation, with numerous additions of Otono Kigoro's Japanese account of Korea. The small gold medals were awarded to W. N. Mañnow, for his anthropological and ethnographical description of the Mordwa (a Finnish tribe of eastern European Russia); to W. Fuss, for the calculation of the results of the Siberian levelling; to Prof. R. E. Lenz, for his

useful work as president of the section of physical geography for seven years; and to Mielberg, for magnetical observation at Tiflis in connection with the polar stations.

The next number of the *Iswestia* of the society will contain an important work of Gen. A. A. Tillo on the level of Lakes Ladoga, Husen, and Onega. In round numbers, the first was found to be five metres, the second eighteen, the last thirty-five metres, above the mean level of the Gulf of Finland. This is considerably less than admitted till now. For the altitude of Lake Ladoga, a height of about twenty metres was generally received; and for Onega, seventy metres.

When the results of the levelling of Lake Ladoga were first calculated, they were received with distrust, and a levelling on another road was made; but the result was confirmed. Other levellings are begun by the Ministry of public works, under the direction of General Tillo, among others, on the upper Volga. The general result is to make the level of the waters lower than they were admitted to be till now.

A movement is under way for establishing a female medical school at St. Petersburg. A few years ago, ladies received instruction at one of the military hospitals, and some of the graduates are practising with honor. Later this instruction ceased, as the minister of war would not continue the subsidy given before, nor allow the use of the buildings. Now the matter is under discussion in the *duma* (city assembly) of St. Petersburg. There are also private subscriptions for this end, and lately the great importance of female physicians is especially insisted upon for central Asia and eastern Transcaucasia; that is, provinces where the great mass of the people are Mohammedans. O. E.

St. Petersburg, Jan. 17.

NOTES AND NEWS.

THE subject of bird-protection is receiving increased attention in England. A 'bird-protection league' has been organized through the instrumentality of Mr. G. A. Musgreave, F.R.G.S., the members of which pledge themselves neither to purchase birds of beautiful plumage nor to shoot rare birds.

—The council of the Practical naturalists' society of England have appointed Dr. J. W. Williams to make a survey of British bird-migration, and prepare a list of migratory species, including those rare and extinct.

—In connection with some letters which have recently appeared in these columns, the following sentences from Mr. Keltie's report will be of inter-

est: "Good large reliefs of limited areas, in which the two scales are as nearly as possible the same, are, in my opinion, of great service in geographical teaching; but relief-maps of large areas, constructed and colored as I have seen some of those much advertised in this country [England] by unskilled mechanics, in which the scale of altitude is indefinitely magnified, are exceedingly mischievous."

—The valuable collections of mesozoic and cenozoic invertebrate paleontology, in the possession of the national museum, have been arranged for reference and study. They consist of the material obtained by all of the earlier explorations of the west, and the various geological surveys, as well as the numerous contributions to the Smithsonian institution. Heretofore these collections have been practically inaccessible, owing to their deranged condition. Over fifteen hundred figured types are included in this material; and a preliminary catalogue has already been issued.

—Bulletin 31 of the national museum, Monograph of the Syrphidae, by Dr. Williston of New Haven, will shortly be issued.

—The recent purchase of new quarters for the Cosmos club of Washington has had a marked effect on the number of applicants for membership. The quota of members composing the club (250) will be speedily filled.

—Of the three colleges—Columbia, Harvard, and University of Pennsylvania—that received the benefit of the Tyndall fund, Columbia has been the first to act. Her trustees have recently drawn up a series of regulations in regard to the John Tyndall fellowship. The fellow, who is to be appointed on the recommendation of the president and professors in the scientific department, must pursue a course of study and research in experimental physics for the term of one year, and he may be re-appointed. The first incumbent of the fellowship is Michael Pupin, who graduated at Columbia in 1883 with honors, and has since his graduation been studying mathematics and physics at Cambridge, England.

—The fish commission will publish a census of the fisheries of the great lakes; and a corps of clerks is now busily engaged in preparing the tabulated statements of the results of the investigations made last year. The commission is also trying to institute a more systematic method of recording the statistics of the sea-fisheries, and, in co-operation with the treasury department, has issued circulars to collectors of customs at various ports, requesting them to obtain from the masters

of fishing-vessels facts and figures concerning the sea-fisheries in which they are engaged.

—Mr. Charles A. Ashburner, geologist in charge of the Pennsylvania survey, has been invited to deliver a lecture on the geology and mining of petroleum and natural gas before the engineering society at Columbia School of mines, Friday, Feb. 26. The lecture will be illustrated by maps, charts, and lantern-slides, and will embody the results of the state survey up to date.

—The U. S. hydrographic office issues a weekly supplement to the monthly pilot chart of the North Atlantic ocean, which will be of special value to coasters. It contains accounts of every obstruction and danger along the coast, and other matters of interest to seamen, relating to navigation, such as changes in lights or buoys. These bulletins are posted in all the seaport cities; and the maritime community is invited to send any information of value to the central office at Washington, or to any of the branch offices at Boston, New York, Philadelphia, Baltimore, New Orleans, and San Francisco. The object of the hydrographic office is to place within reach of sailors, at no expense to them, such information as cannot be collected profitably by an individual, but which the government can readily gather, at no additional cost, through agencies already established.

—The preparation and preservation of anatomical specimens have always been more or less unsatisfactory in museum collections. The U. S. army and medical museum has recently, under the supervision of Dr. J. S. Billings, instituted a number of important improvements in these respects. Frozen sections, made of bodies with the organs in natural relation—a method practised in Europe for a number of years—are placed in special dishes or bowls, resembling ordinary wash-bowls with the top ground off, attached to a colored background of plaster-of-Paris. A glass cover is then cemented over the bowl, and through a small aperture the space is filled quite full with the preservative fluid. The colors of the tissues are preserved nearly as in life, by special means, and the whole preparation gives a naturalness not possible of attainment by any other method. Another feature, which has been devised at the museum, is a series of sections of the typical crania of the vertebrated animals. The object of this collection is to show the relationship of the bones which enter into the formation of the skull. These sections are made in a longitudinal-vertical direction, and the corresponding bones are painted the same color. Thus, in the series presented, the student can determine at a glance the relative state of development of any particular bone, from

that of a fish to that of a human being. The sections are then mounted, one set displaying the structure of the internal part of the cranium, the other representing the bones as they appear from the outside.

—The 'Geological railway guide' that was in course of revision for an enlarged second edition by the late James Macfarlane at the time of his death, is now in the hands of his son, James R. Macfarlane, 100 Diamond Street, Pittsburgh, Penn., who will edit and publish the work at an early date. Judging by the sample sheet, from which extracts were given in *Science* some months ago, the new edition will give a large amount of information directly useful to the travelling geologist, and will be a fitting memorial of its projector.

—In a discussion of the temperature of Munich by Erk, in the annual volume containing the observations of the Bavarian meteorological stations, the corrections are computed to reduce the mean of certain ordinary hours of observation to the true mean of the day. For the mean of 7.2 and twice 9, the reduction is $-0^{\circ}.02$ C., varying from $+0^{\circ}.14$ in October, to $-0^{\circ}.16$ in May and July; for 8.2 and twice 10, it is $-0^{\circ}.06$, varying from $+0^{\circ}.04$ in October, to $-0^{\circ}.17$ in April and May; for the mean of maximum and minimum it is $-0^{\circ}.08$, varying from $0^{\circ}.00$ in December, to $-0^{\circ}.30$ in October. Similar corrections have been made for a few places in this country. Additional ones are needed for many more stations, on account of the considerable diversity of hours of observation still prevailing among amateur meteorologists, on whom much of the knowledge of our climatology depends.

—Mr. Alfred Russel Wallace, the eminent naturalist, says the Boston *Beacon*, is quietly planning an early visit to this country. He intends to pass some time in California, but may possibly accept a few invitations to lecture.

—The *Geographisches Jahrbuch* has just published interesting statistics in regard to the societies and publications devoted to geographical research. Those who have not been especially interested in these studies will be surprised to learn that there now exist, throughout the world, ninety-four active geographical societies, with a membership of nearly fifty thousand. This does not include fifty-eight societies in which geographical researches are subordinated to others. The entire income of these societies amounts to more than a quarter of million dollars annually, most of which is spent in the publication of transactions or in the furtherance of explorations. Of these ninety-four societies, France has twenty-six, with a membership

of eighteen thousand; Germany, twenty-four, with nine thousand members; Italy and Switzerland, six each, with three thousand members; Great Britain and her colonies, five, with five thousand members and an income of nearly seventy-five thousand dollars; the United States, two, with fifteen hundred members. A hundred and twenty-six periodicals are devoted to geography, of which forty-two are published in French: thirty-eight in German; eight in Russian; seven in Italian; six each in English, Spanish, and Portuguese; and one each in Danish, Hungarian, Swedish, Roumanian, and Japanese.

—The French academy, says the *Révue botanique*, has recently announced the discovery of the entire efficacy of sulphate of copper in the destruction of *Peronospora viticola*, the American fungus or mildew of vines, the great scourge of vineyards over large areas of the United States.

—The Manchester philosophical and literary society possesses, says the *Chemical news*, a microscopic slide containing the Lord's prayer, written within the space of the four-hundred-and-five-thousandth part of an inch. To find this minute speck requires the exercise of much patience, as it is not only necessary to have just the right kind of illumination, but the focus of the lens must be on the true surface of the glass on which the object is written. When once seen with a low power, it is not difficult to find with the same power; but with the half-inch and higher powers it is always a trial of patience, even when the position of the object has been carefully registered with a lower power, and you are sure that the object is central in the field. Perhaps with the achromatic condenser some of the difficulty may be removed. This wonderfully minute object was written, or rather engraved, by Mr. Webb, years ago, by the aid of an instrument now in the possession of the society. Webb was accustomed to write the Lord's prayer in spaces of the five-hundredth to the ten-thousandth of an inch, and, as has been seen, to the four-hundred-and-five-thousandth.

—A writer in a late number of *Ciel et terre* states, that under the most favorable conditions, from the summit of the Dôle (altitude, 1,678 metres), all the summits of the Alps are easily visible, from that of Pelvoux (4,000 metres), seventy-eight miles to the south, to the peak of Säntis (2,504 metres), clearly outlined in white against the deep blue of the horizon, one hundred and three miles distant. The view thus embraces all the peaks of the chain of the Alps for an extent of more than one hundred and fifty miles. Contrary to that which has been observed in

lower altitudes, the writer asserts that the time is generally more favorable for vision in the afternoon, and that it is at sunset that one obtains the best views in the Alps.

—The geographical society of Lisbon has recently published a list of the journals in the Portuguese provinces, printed in that language. This list includes the names of nineteen in Angola, six at Cape Verde, seven in China, two in Guinea, fifteen in English India, seventy-two in Portuguese India, seventeen in Macao and Timor, ten in Mozambique, and three in the island of St. Thomas. In addition, seventeen are published in Portugal, which are devoted to the interests of the foreign Portuguese provinces.

—Interesting experiments have lately been made by Dr. Parsons, we learn from *Health*, on disinfection of clothes and bedding by heat. These experiments, among other points, have shown what degree of heat, and duration of exposure, are necessary under different conditions (e.g., of moisture and dryness) in order to destroy with certainty the germs of infectious disease. The net results of Dr. Parsons's experiments on this head are as follows: with the exception of spore-bearing cultivations of the bacillus of splenic-fever, all the infective materials reported on were destroyed by an hour's exposure to dry heat of 220° F., or five minutes' exposure to steam at 212° F. Spores (or the reproductive particles) of this bacillus required for destruction four hours' exposure to dry heat of 220° F., or one hour's exposure to dry heat of 245° F., but were destroyed by five minutes' exposure to a heat of 212° F. in steam or boiling water. It may therefore be assumed that the germs of the ordinary infectious diseases cannot withstand an exposure of an hour to dry heat of 220° F., or an exposure of five minutes to boiling water or steam of 212° F.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

Did Dr. Hayes reach Cape Lieber in his arctic exploration of 1861?

THIS question has given rise to much controversy of late years; and, for the sake of truth, it is highly desirable that it should be satisfactorily answered, although this could only be definitely done by the discovery of the cairn, with its enclosed statement, deposited by Dr. Hayes at the highest latitude reached by him.

The writer believes he can throw some little light on the question, from the fact that he had the original records before him, worked up the astronomical observations (Smithsonian Contributions to knowledge, No. 196, February, 1865), and constructed the chart of the expedition, under the doctor's immediate

direction, from the materials prepared by him. A tracing of this chart, upon which Dr. Hayes first assigned and wrote the geographical names, and with his signature attached, is still in my possession. It is reproduced in the work quoted above.

The west coast of Kennedy Channel was first seen and remarkably well outlined by Morton, of the Kane expedition, in June, 1854, and has since been passed and repassed by many explorers: we may therefore take, for the purpose of comparison and reference, the latest excellent delineation as given on the chart (No. 962) issued by the hydrographic office of the navy, in February, 1885, and which is supposed to embody our best geographical knowledge within its region.

We shall first collate Dr. Hayes's narrative ('The open polar sea,' New York, 1867) with this chart, and see where this will land us. The dates of this part of the narrative are unfortunately very scanty, and need identification in order to trace the progress and position of the party from day to day. Dr. Hayes reached the western coast of the Kane basin May 6, 1854, while a member of the Kane expedition, at or near Cape Frazer, in latitude 79° 45'. Page 336 (of the narrative) he says, "Our camp was made near the farthest point reached by me in 1854." This was on May 14, 1861, as identified by me by means of the astronomical latitude recorded for that day (p. 20 of the 'Physical observations,' etc., of the Smithsonian publication). The resulting latitude, 80° 06', appears, therefore, too high in comparison with our chart. Dr. Hayes there found his old flag-staff still standing, and remarks, 'We were now within Kennedy Channel,' and is struck with the circumstance (p. 339) that no land was visible to the eastward, as he could easily have seen fifty or sixty miles in the clear atmosphere; here he concludes that Kennedy Channel must be much wider, and assigns to it a width of over thirty miles, when in reality it is but twenty nautical miles. He was then fully forty nautical miles south of the entrance of the channel (which is at Cape Lawrence), and looked out on the Kane basin, instead, as he supposed, toward the eastern shore of the channel.

Here, then, at the very outset, we meet with what we must now regard a mistake, the influence of which may have injuriously biased his judgment as to the extent of his further progress. The next day (May 15) his strongest man, Jensen, broke completely down, and was left at Jensen's camp. This is south of Scoresby Bay, since this deep bay (p. 343) was passed on May 16. On this day he believed himself to be in a higher latitude than Morton had reached, which was about 80° 30'. On May 18 he appears to have been in the vicinity of Cape Collinson. Apparently no mention is made, in the narrative, of the crossing of Richardson Bay; but on May 18 he was finally arrested by a large bay, twenty miles in length (pp. 346-348). This, according to our chart, could have been no other than Rawlings Bay: here its southern cape, known as Cape Good, in latitude 80° 16', would consequently mark his highest point reached. Between Rawlings and Lady Franklin bays there is no other long bay. That named after Carl Ritter is apparently not over two or three miles in length; and Lady Franklin Bay does not fit the description of his highest bay, inasmuch as its head could not be seen from Cape Lieber, not even the point where the bay divides into two long fiords. This comparison, then, would lead to the conclusion that he never

entered Kennedy Channel at all, and that his supposed Cape Lieber was in reality Cape Good, always provided that our comparison chart is fully to be trusted.

Opposed to this conclusion of a material contraction of the route, we have, in the first place, the explorer's own assertion on the spot, and he ought to know how far he had gone. The paper placed by him in a bottle buried in the cairn gives his highest latitude as $81^{\circ} 35'$ (p. 351 of the narrative), — an opinion to which he ever afterwards strenuously adhered; secondly, we have his chart, with his track extended to the southern cape of Lady Franklin Bay, and which is supported by his astronomically determined latitude on May 17, at Farthest camp, in $81^{\circ} 31\frac{1}{2}'$ (see p. 20 Smithsonian publication). Those who believe that he fell short of his asserted position must discredit this last observation. Indeed, the comparison of the result of this latitude observation with the next one, which gave the latitude $79^{\circ} 58\frac{1}{2}'$ (*ibid.*, p. 20), taken May 20, on his return, the day after he left his highest point, has furnished material for criticism (by Dr. Bessels), as it appeared incredible that so long a distance should or could have been traversed in a single day. Yet we should remember that arguments based upon speed alone are rather treacherous: thus it took Hayes forty-six days to reach his highest point on the outward trip, and but fifteen days to return thence to the schooner. It is true he had to carry a heavy load when setting out; but this is compensated by the retardment due to physical weakness of the party, both men and beasts, during their return. No journal was kept by the leader on the home-trip, his whole energy being required to save himself and party; and his prostration was such, that he lost the day of the week by one (as he stated to me), and had to recover the date on his arrival on board ship. He also had the misfortune of having his chronometer run down during a prolonged sleep when near his Cape Lieber.

It is not surprising, that, under these circumstances, his observation at Farthest camp should be defective; but it is particularly unfortunate that he left no means of knowing how he determined his meridian, his practice being to observe but a single altitude of the sun. It is highly probable that the observation was made with the sun in some other vertical than that of the meridian, hence was at a lower altitude, and consequently gave an abnormally high latitude for his place. May he not have estimated the time of the meridian passage, and mistaken the direction of the north and south line? It is noteworthy that he greatly misplaced the direction of the western shore (and axis) of Kennedy Channel, which is about $N. 30^{\circ} E.$, while his chart makes it trend nearly due north ($N. 5^{\circ} E.$).

It may be asked, How could Hayes locate on his chart, with approximate correctness, the western shore-line as high as $82^{\circ} 15'$ (Cape Union), supposing him to have been unable to cross Rawlings Bay? To this it might be replied, that this shore had already been traced by Morton up to this northern limit (see chart in vol. i. of Kane's 'Explorations,' Philadelphia, 1856).

Without pretending to give a conclusive reply to the question at the head of this article, I shall content myself with having pointed out the nature of the difficulties which beset it; and, while the balance of probability seems to point to a decision unfavorable to the claim, I entertain the hope that some future explorer may discover the rough but sufficient

monument by which alone a positive and just decision can be arrived at.

An extract from Lockwood's diary, given on p. 95 of *Science*, No. 156, stating that he, as well as Dr. Pavy and Major Greely, agreed in the opinion that Hayes never reached Cape Lieber, induced me to examine the subject anew, with the result as given above.

CHARLES A. SCHOTT.

Washington, Feb. 7.

An open letter.

Prof. SIMON NEWCOMB, *President of the American society for psychical research.*

DEAR SIR, — The writer of the accompanying communication has misapprehended the function of the Society of naturalists: but the phenomena he describes fortunately fall within the purview of the association over whose deliberations you preside, and I therefore commit it to your hands.

Very respectfully,

G. K. GILBERT.

Mr. G. K. GILBERT, *President of the American society of naturalists, Washington.*

For the good of science, and in the interest of humanity, I address your worship, entering at once upon my subject.

At the meetings of a spiritualistic society, the members of which bear an unimpeachable character, during the course of about three years of daily experiments by means of the spirit-table, the self-called spirits that were evoked have dictated a treatise, and now demand that it be given to the press, and bear the title 'Spiritualistic apocalypse,' asserting that such publication is necessary for humanity.

In this dictation it is established and explained, with marvellous clearness, learning, and scientific language, what is 'power' and what is 'force,' and how these two perform their functions in harmony through eternity and through space. Next there is established the fact of a living magnetic current, which will give occasion for new discoveries, and a metaphysics of social harmony, with absolutely new arguments, on which it will be well for society to reflect seriously. Moral science is lighted up in its true profile, and not from the utilitarian side. Religions are placed in the position which they deserve, and indirectly the true religion is pointed out. There are weighty political prophecies; one of them, a very beautiful one, having been dictated by a spirit who said he was General George Washington. There are useful counsels for organic social reforms, learned astronomic communications, and surprising explanations of fundamental theologic philosophy. Physics, chemistry, and algebra are largely, and with critical judgment, employed in the development of the theorems thus established. There are instructive dialogues and trilogues among spirits of diverse nature and degree, but identical in substance. Finally, the virtual necessity of the why and how of their existence is explained. This, in brief, is what the self-called spirits have dictated, and what they wish humanity to know.

My companions and friends, before publishing this collection, in order to have some fact that might induce persons to read it and reflect on it, under the influence of a firm assurance that it is not the offspring of our own minds, have asked the dictating spirits' permission to invite other experimenters to

inquire, by means of their mediums, whether what has been dictated to us has really been dictated by them, and whether its publication has been demanded. In obtaining this permission we were assured that the spirits would everywhere assert the truth of the fact. In case this event should take place, your worship will understand its weight and importance; and this is the reason why I, always in the name of science and humanity, ask you to bring together under your supervision competent and honest persons, and, employing known spiritualistic mediums, to call forth the spirits and ask them:—

1. Is it true that at Catania a perfectible spirit, by order of his prime spirit, has dictated a work which he wishes to be called 'Spiritualistic apocalypse'?

2. Are the premises established, and the consequences deduced, from the theories and principles dictated in this work the true ones?

3. Will this work be useful to humanity? And, further, all other questions which may be thought necessary to ascertain the truth.

I likewise pray and authorize you, in the name of my friends, to invite other scientific societies, and individual men of science, to make similar experiments, with the request that you will have the kindness to communicate to us the answers obtained.

In the hope of soon having the honor of seeing your handwriting,

I remain with all respect and obedience,

Yours devotedly,

ANTONINO SCAVO VITA.

Catania (Sicily), Jan. 20.

Montana climate.

The interesting notes of Dr. Dawson and Mr. Davis on the origin of the Chinook winds of the north-west are undoubtedly correct. Their characteristics are exactly those of the *foehn*. But Dr. Dawson limits the range of these winds too much. They extend at least as far south as the great western bend of the Rocky Mountain divide, north of Henry's Lake; and their tempering influences reach to the extreme boundary of Montana.

In recent climatological articles in *Science*, I notice several misleading references to 'Montana climate,' as if it were comparable, in steady, extreme cold, to the winters of Siberia, or even Canada. This is far from being the case. There is no such thing as a 'Montana climate.' The climate of Port Assiniboine and Glendive is one thing, while that of Bozeman and Helena is quite another. Here seems to be the battle-ground between the cold waves descending from British America, and the temperate western currents from the Pacific. Changes are sometimes very sudden from temperatures far below zero to above the freezing-point, and *vice versa*, as one or the other gets the upper hand; but many a cold wave which extends from the mouth of the Yellowstone to the Atlantic is deflected by the pressure from the west, so as not to be felt in central Montana. The recent severe storm, for instance, kept entirely east of us. On Feb. 2, the minimum at Assiniboine was -16° ; at Benton, -1° ; at St. Paul, -26° ; while it was $+15^{\circ}$ at Helena, and $+33^{\circ}$ at Bozeman. It was calm and mild here, and not till two days later did the thermometer reach the freezing-point at Benton. Mild weather has since prevailed throughout Montana.

The only extreme cold weather experienced here was during the January storm on the Pacific, when

we had a week of below-zero weather, with a very low thermometer, — something very unusual here, and altogether unaccountable to me, until I learned of the storm on the coast.

If it were not for the warm Pacific currents, our winter climate would probably be arctic; but those currents make it usually far milder and more enjoyable than at corresponding latitudes farther east. In 1885, when during February and March one blizzard succeeded another from Dakota to the seaboard, I gathered buttercups (*Ranunculus glaberrimus*) in bloom at Bozeman on March 15; and on April 5 I gathered more than half a dozen species of flowers (*Ammoni patens*, *Douglasia montana*, *Phlox canescens*, *Fritillaria pudica*, *Synthyris*, *Townsendia*, etc.) on a mountain side, at an altitude of about six thousand feet near the Bozeman tunnel, the highest point on the Northern Pacific railroad.

I send you enclosed specimens of what I gathered yesterday (Feb. 7): *Ranunculus glaberrimus* with well-advanced buds, well-developed catkins of alder, and catkins of willow and quaking asp, showing the white, silky covering.

P. KOCH.

Bozeman, Montana, Feb. 8.

Oil on troubled waters.

During a portion of the years 1839-41, the writer, as a boy, got an experience of life on the ocean in New Bedford whalers (two of them). Though a boy, I was noted for 'seeing every thing.' Being between decks one day, whilst the vessel was lying to in a storm, I observed, that, with every lea-lurch, the weather-seams opened, and let in the daylight and frequently much water. It seemed to me a dangerous condition, and I hastened to report to the officer 'of the deck,' 'on deck,' or 'of the watch.' He only laughed at me, and told me to rig the pump and pump her out, if I thought she was sinking. He said, 'The way they make a whaler is to buy a worn-out merchantman, put a new deck on and new sticks in her, and send her out as a new vessel; and you know what the Bible says about putting new and old together? Well, it oftens happens in such cases that the old hull sinks, and the deck and spars sail on as though nothing had happened. Oh! we get used to that.'

That I knew to be 'a yarn;' but when I saw a 'merchantman' laboring in a sea that was not very bad for a whaler, and learned that the life of a 'merchantman' was much shorter than a whaler's, I wanted to know why, for it seemed to me that there must be a reason for it. I found, for one thing, that whalers always made better weather than merchantmen, when they were in company; that seas would not break in our wake, that would in the wake of a merchantman; that the wake of a whaler was persistent, whilst that of a merchantman was rather evanescent; and that placid waters, or 'short seas,' are the rule on 'cruising ground,' when whales are about. All 'whalers' have their decks, at times, reeking with oil; and, although the decks are 'washed down' daily, it takes a great many washings to free them from all the oil; and much that goes out of the scuppers clings to the sides of the vessel to be gradually washed off by the sea.

A little oil goes a great way on a car-wheel to relieve friction, and it does in that case what it does on water in a storm. I think rain acts in the same way in beating down waves. The drops roll to land-

ward, and in rolling react upon the waves, each a little; but the aggregate is enough.

GEO. F. WATERS.

The competition of convict-labor.

In my criticisms of Mr. Butler's articles on this competition, I have shown that his method of stating the figures in totals, regardless whether these totals are in that relation which is the question at issue, namely in competition, is irrelevant.

Now, in his last rejoinder (*Science*, vii. No. 158), he brings some figures which are relevant in showing this relation in two trades in New York, — hat and shoe making. In the former, for the year 1879, the ratio was 320 convicts to 5,267 free workers in the first trade, and 1,927 convicts to 26,261 in the second. The first ratio, he says, is 'about 4 per cent,' and the second 'something over 4 per cent.' In addition to questionable ethics and statistics already displayed, he now introduces very questionable arithmetic; for in reality the first ratio is 6.45 per cent, and the second 7.88. One who thus figures may well have, as he says, 'some hesitation in adducing fresh figures' ('fresh' in the sense of new, of course), 'for fear they may be summarily rejected as useless,' True, Mr. Butler, but not for the reason you give, — "because they do not fit in some person's idea of how the 'course of nature' ought to go." No 'person' has said or implied any thing about 'ought' in relation to the 'course of nature' or any other relation.

Those who are organizing the working-classes into a political party, to obtain what they deem justice, are in earnest. Only one who has not felt the dreadful sensation of being unable to sell his labor, when that is necessary to sustain life, can realize the bitterness and pain of such a situation. For every convict whose labor-product is sold in the market, a free laborer becomes superfluous, and therefore fewer work, or all are laid off temporarily, in that branch into which the convict is introduced. Here the 'political economist' of the prevailing order says, 'Find something else to do.' In most cases it is impossible.

There is another evil effect on free labor, resulting from prison-labor competition under any form; and that is, the effect it has to lower the rate of wages in any branch it enters. It must gain its market by underselling free-labor products; and however small the percentage, both as to its amount and of the decrease of its price, it lowers the standard of prices, including wages, in that entire branch.

To the workingman, a market for his labor is necessary to life: to the state, a profit from the prison is not essential.

Shylock, surely not an insane humanitarian, truly says, "He takes my life who from me takes the means whereby I live." E. LANGERFELD.

Is the dodo an extinct bird?

Have the recent excursions in theosophy, of my young friend Dr. Shufeldt (see *Mind in nature*, January and February), spoilt a very promising ornithologist to the extent of making him mistake a live Samoan tooth-billed pigeon (*Didunculus strigirostris*) for the astral body or the projection of the double of a perfunct dodo (*Didus ineptus*)?

ELLIOTT COUES.

Smithsonian inst., Feb. 14.

Corrections of thermometers for pressure.

The letter of Messrs. Venable and Gore in the last number of *Science*, on the effect of pressure on thermometers, contains a reference to the signal service, of such a character as to deserve a brief notice. It comes near leaving the impression that the service has just begun to consider a phenomenon which has been well known to most meteorologists, and to all engaged in accurate thermometric research, for more than fifty years. The letter, to which reply was sent from the office of the chief signal officer, made inquiry as to whether the service had ever published any thing on the subject, how thermometers used on Mt. Washington and Pike's Peak were compared with standards, and requesting information on the subject. The particular phase of the question which the service has 'had under consideration' was, whether the effect on the thermometers used in the service was sufficient to justify the application of a correction. To this end, some experiments had been made, the results of which were communicated to the writer of the letter. The correction necessary for Pike's Peak, which is the most elevated station from which the service receives reports, amounts to a few hundredths of a degree; and the propriety of its use is doubtful. The references quoted by the writers of the letter in *Science* were furnished them by the chief signal officer in his reply; the paper of Loewy and the memoir of Marck being quoted as among the latest and most complete. The phenomenon has by no means escaped the attention of writers. Among works likely to be easy of access, it will be found noticed in the 'American cyclopedia,' 'Johnson's cyclopedia,' Deschanel's 'Natural philosophy,' Balfour Stewart's 'Heat,' and doubtless many others of that class. It is noticed in numerous reports of the British association, especially in the reports of the committee on underground temperatures. One of the earliest investigations of the subject was by Egen (*Pogg. ann.* 1827). Sir William Thomson considered it, and provided against it, in 1850, in his verification of Prof. James Thomson's prediction of the lowering of the freezing-point by pressure. Professor Rowland considered it, and allowed for it, in his research on the mechanical equivalent of heat. In *Nature* (1873-74) it was much discussed; and of course it has been a matter of vital importance in all modern deep-sea temperature-work, in the reports of which it receives full discussion.

SIG.

Washington, D.C., Feb. 15.

Tadpoles in winter.

I have frequently observed tadpoles during winter, in ponds that were entirely frozen over, swimming about underneath the ice. Most of them were of large size: I remember none being less than three or four centimetres in length.

Although, in this latitude, most of the frog-spawn is deposited during the first warm weather of spring, and the hatchings of these spawns develop into frogs before the following winter, yet spawns occasionally occur in late summer or early fall; and the hatchings of these late deposits fail to mature within the same season, and consequently, in favored localities, live until the following spring, when they transform into frogs.

C. C. GREEN.

Middleport, O., Feb. 10.

SCIENCE.—SUPPLEMENT.

FRIDAY, FEBRUARY 19, 1886.

VIRCHOW ON ACCLIMATIZATION.

AT the congress of German naturalists and physicians held at Strasburg, Professor Virchow, the eminent pathologist, delivered an address on 'Acclimatization and the Europeans in the colonies,' of which the following is an abstract.

In these days of colonization, in which large numbers of human beings leave their homes and settle in foreign lands, under strange and unaccustomed conditions, the subject of the probable influence of such change upon themselves and their descendants becomes highly important from a practical point of view. The key to this problem is in the hands of physicians. With one or two notable exceptions, the subject has been neglected by scientific men. An opinion is current, and is often believed by those who send out colonies, that man is able to adapt himself to living on any part of the earth; that he is cosmopolitan in the widest sense. This view has allied itself to the monogenetic theory, which believes in the original common origin of all mankind from one pair, because thus this cosmopolitanism would simply be the return to former conditions. It was the changes from this primitive condition which caused the variations in the races of men.

Pathology is to be regarded, not simply as the study of the action of accidental causes upon man, which change his normal condition, but as necessary a science as physiology. Every biological science, zoölogy, botany, must have its pathology. It is a method of research, an experiment in vivisection which nature has made for us without shedding a drop of blood. From this point of view, all deviations, at first perhaps accidental, which become fixed by heredity, belong to the field of the pathologist. That such pathological variations are possible, one case is sufficient to show. A woman had a congenital defect of the arm, in which the radius was bent in a peculiar position, and the thumb of each hand was wanting. This woman's child was affected precisely in the same way, except that on one hand the thumb was in a rudimentary condition. In neither case was there an injury, but the accidental variation was transmitted. The question of the permanent acquisition of these pathological traits is a more difficult one.

The effects of a new climate upon the emigrant are well known, and are greater as the conditions of his new home differ more radically from those of his mother-country. A sort of new growth must take place, a new adaptation to the environment. A prominent symptom is a feeling of languor, which lasts for days, weeks, or even months. Two kinds of disease are apt to beset the emigrant: the first is the climatic indisposition already mentioned; the second, the real climatic disease. The life of the individual is then in danger, until the question is decided whether his body has the power of adopting the new conditions or not. It is on this point that clinical observations in different countries are needed. In this organic transformation of the individual the fate of his descendants is involved. It is here that ethnologists become interested to find proofs for their theories that small variations become fixed and lead to racial differences. Experimental evidence on this point is still wanting.

The question of greatest interest to us is, To what extent has the white race, in its historic evolution, shown the power of adaptation? The white race is not a simple one, and distinctions must be made. The Semitic, as opposed to the Aryan branch, has a very great superiority in this respect. Again, the southern nations—Spaniards, Portuguese, Sicilians—have a greater power of adaptation than the northerners. In the colonization of the Antilles, the attempts of the English and French have been more or less disastrous, while those of the Spaniards have been quite successful. The general proposition, which is only a provisional one, seems to be that a southern people can emigrate to an equatorial region without danger. The readiness with which a population mixes with another is also of importance. The more southern Aryan peoples more easily assimilate with the Semitic element than the northern ones. This Semitic element, which appears early in the Phœnician expeditions to foreign lands, is best suited for founding permanent colonies. To this day, relics of the settlements all along the coast of the Mediterranean, made by Semitic people, can be traced.

Those white races which cannot become acclimatized without great loss may be called vulnerable, and the regions of the globe which are open to them are very limited.

North America is one of these favorable regions. The French were able to found a flourishing and

active colony in so cold a country as Canada. The United States, with its mixture of nationalities, is another such region. The acclimatization, however, is not brought about without considerable change in the mental life and characteristics of the people. The Yankee is strikingly different from the Englishman. The real sign of the longevity of a colony is the relative birth-rate and mortality as compared with that in the mother-country. The general result is, that, the farther south we go into the tropical countries, the lower does the reproductive power of the colony become, until in a few generations sterility is more and more prevalent. Of this, the Creoles are a good example. The special cause of this degeneration has been regarded by physicians as a lack of the formation of blood, a general anaemia. This explanation, however, is not final; and a further cause, such as the presence of micro-organisms in the water, is to be looked for. The great prevalence of liver-disease in such cases offers a valuable clew.

It is considerations such as these which make us feel the want of thorough scientific research of the conditions which control the foundation of colonies. When these are known, it will no longer be necessary to make sacrifices of thousands of men in an idle attempt to make inhabitable some desolate unfavorable region. The order of national adaptability to new environment we have made out to be, first, the Jews; then the Spaniards, Portuguese, etc.; then the southern French and the northern French; and lastly the Germans. The remarkable immunity of the Jews is a question of great interest. What share in this peculiarity is due to their peculiar hygiene, choice of food, devotion to the home sentiment or to their occupation, is an open question.

THE TRADE IN SPURIOUS MEXICAN ANTIQUITIES.

THE present is a museum-making era, and future generations are perhaps to be congratulated that such is the case; but this wide-spread fancy for hunting and hoarding relics has given rise to minor features greatly to be deplored. The increased demand has given a considerable money value to antiquities; and this has led to many attempts, on the part of dishonest persons, to supply the market by fraudulent means. To such a degree of perfection has the imitation of some varieties of relics been carried, that detection is next to impossible. Doubtless in time most of the spurious pieces will be detected and thrown out; but in the mean time they will have made an impression upon literature, and upon the receptive mind of

the public, that is most difficult to eradicate. In view of these facts, it would seem to be the duty of interested persons to publish, at the earliest opportunity, all reliable information tending to expose frauds and correct erroneous impressions.

It is perhaps in stone, and especially in steatite, that frauds are most frequently attempted; but the potter's art has not escaped, and most of our collections contain specimens illustrating the skill of the modern artisan and the carelessness of collectors. Although we need not go beyond our own borders for illustrations of this statement, I wish here to call attention to some examples from Mexico. In pre-Columbian times the native potter of that country had reached a high degree of skill in the handling of clay; and Spanish influence has not been sufficiently strong to greatly change the methods, or restrict the manufacture. It is very easy, therefore, for the native artisan to imitate any of the older forms of ware; and there is no doubt that in many cases he has done so for the purpose of deceiving. A renewed impetus has been given to this fraudulent practice by the influx of tourists consequent upon the completion of numerous railways.

The variety most frequently imitated is a soft, dark ware, sometimes ferruginous, but generally almost black. The forms are varied, including vases, statuettes, pipes, whistles, and spindle-whorls, all of which are profusely ornamented. One notable form is a vase modelled in dark clay, and bristling with a superabundance of figures in relief, which give a castellated effect. A large piece recently acquired by the national museum was designated a 'miniature stone fort' by the collector, and a second piece could as readily be called a Chinese pagoda in clay.

The body of these vases is usually a short, upright cylinder, mounted upon three feet, and is profusely decorated with incised patterns and with a variety of ornaments, including human and animal figures in the round. A row of figures surrounds the rim, giving a battlemented effect; and a high conical lid, surmounted by a human figure, is usually added. The body of the vessel is modelled by hand; and the flatter portions of the surface are rudely polished, and covered with incised patterns. The attached figures are formed separately in moulds, and afterwards set into their places. Certain parts are further elaborated by means of figured stamps. After finishing, the vases are prepared for market by burial for a short time in the moist earth, or, more frequently perhaps, by simply washing them with a thin solution of clay. The deposit of clay is afterwards partially wiped off, leaving the lines and depressions filled with the light-

colored deposit. So clever are these fellows, that the vessels are sometimes slightly mutilated before they are submitted to this finishing process.

This ware may be purchased at any of the relic-shops in the city of Mexico; but San Juan Teotihuacan seems to be the headquarters of the traffic. In passing back and forth by the railway, I found that each train was met by one or more of the venders, who were careful to expose but a limited number of pieces, and that this method of sale was systematically practised. Wishing to secure a piece, I waited until the train was about to move off, when I held out a silver dollar, and the vase shown in the accompanying figure was quickly in my possession. The price asked was five dollars, and in the city of Mexico would have been three times that amount. At the rate of purchase indicated by my experience at San Juan, at least one piece per day was carried away by tourists, making hundreds each year. It is not wonderful, therefore, that museums in all parts of the world are becoming well stocked with this class of Mexican antiquities. Oddly enough, no such ware is found among the antiquities of the locality; and none, so far as I know, occur on the site of any ancient Aztec or Toltec settlement. Notwithstanding this fact, the venders do not hesitate to assign definite localities to the relics, and to give full accounts of their discovery. One of the national museum's pieces is said to have been discovered by workmen in digging a well fifty feet beneath the surface; and another, an excellent lithograph of which appears in the *Zeitschrift für ethnologie* for 1882, is reported to have been found in a cavern at San Juan Teotihuacan.

The ease with which such pieces can be obtained should convince collectors that something is wrong; but a close examination of the specimen generally yields much additional evidence. It is well known that any article buried for a long time in the earth will be thoroughly discolored, and that every crack and cavity having the least connection with the surface will be completely filled with sediment; but in many cases it will be found that in spurious pieces the doctoring with washes of clay has been too hasty, and that small patches, especially in unexposed places, are not in the least discolored. An attractive whistling vase of complicated structure, recently purchased by an American resident of Mexico, was found, upon close examination of obscure parts, to have come but recently from the furnace.

It should be observed that earthenware similar in type to these modern examples, but not bearing the same evidence of recent manufacture, is given a prominent place in the Mexican national museum; but I am unable to secure any information

in regard to its pedigree. It is evident that this dark, ornate pottery does not all belong to the immediate present; but no one seems to be able to say just when or where its manufacture began.

An American officer engaged in the Mexican war brought back a number of fine pieces now on exhibition in the U. S. national museum. They are said to have been dug up near the village of Texcoco. Well-authenticated Texcocan pieces resemble this dark pottery in color and texture more closely than any other; and it is possible that here it was originally made.

It is perhaps doubtful if any of the elaborate



EXAMPLE OF MODERN-ANTIQUE MEXICAN VASE (HEIGHT, 11 IN.).

pieces (now so numerous in collections) in which stamps have been freely used, and which have been in whole or in part cast in moulds, date back to pre-Columbian times. The whole genius of aboriginal methods of procedure goes to discredit them. All the wonderful specimens of earthenware known to have been recovered from ancient sites, however complex in structure, or ornate in embellishment, are modelled by the hand alone, without the aid of such devices. If this statement shall prove to be too broad, the error will be in the right direction if it leads to the

critical inspection of all reputed antiquities bearing the marks of these un-American methods of manufacture.

If the methods are questionable, the spirit is more so. True native art is consistent: each part bears an intelligible relation to all other parts. It will be seen by reference to my illustration that these vases are not even imitations of genuine work, but compositions made up of unrelated parts (derived, may be, from ancient art), and thrown together without rhyme or reason. Fraud is stamped upon every contour, and written in every line.

W. H. HOLMES.

EAST GREENLAND ESKIMO.

ANTHROPOLOGISTS have been waiting with great interest the information which Lieutenant Holm has to convey regarding the wild Eskimo of East Greenland, only recently known, and among whom he was the first civilized man to penetrate. He remained among them last winter; and an exhibition has just been made at Copenhagen of the ethnological objects which were procured from them. These people live about the bay of Augmagsalik. In the various settlements there were, in the winter of 1884-85, 548 souls, of whom 413 are situated near the above bay, and the rest on the coast between Fingmiamiut and Pernstorff fiord. There are 247 males and 301 females, who possess 142 kayaks and 33 umiaks, or large skin boats. The language is the same as that of the west coast; but the voices of the east coast people are more soft and agreeable. Their habit is erect, the face characteristic, the nose more prominent than with the other Eskimo. Their religion and legends agree exactly with those of the western coast.

They wear dressed skin in summer, fur clothing in winter. Their boots are double; and in winter both inside socks and boots are made of fur on the inner side. Bear-skins are the most prized. Caps are made of white or blue fox-skin with the tail left hanging behind. Pretty embroidery and inlaid party-colored fur are in use, as is a sort of wooden shade against sun and rain. Combs of musk-ox horn are cut out with shark's teeth, and used to confine the hair, which is often knotted on top of the head. Clothing is only worn out of doors; within the huts the women wear a breech clout, while the others are entirely naked up to their fourteenth year, when the boys are given a pair of breeches as a sign of maturity. The greatest desire of the women is to have a son, and a marriage is not regarded as complete until the wife has become a mother. In order that the child may be a boy, the women are made to dance in a way to make a figure of eight on the floor: this,

if rigorously followed, should determine the sex of the expected infant. As in north-west America, boys are often married to old women; but the tie does not hold unless children are the result. Some men have two wives, so as to have two rowers in their boat. Only one unmarried woman was met with. The men frequently exchange wives; and the possession of male children is considered excellent luck, whether a woman be married or not. Salutation is by rubbing noses. Men of sixty years of age are very rare. When an individual is seriously ill, he consents, if his relatives request it, to end his sufferings by throwing himself into the sea. It is rare that a sick person is put to death, except in cases of disordered intellect. The dead whose ancestors have perished in the sea are thrown into the sea. Others are interred, or laid on land and their bodies covered with stones. With them are put their most precious treasures. The friends and relatives express grief in different ways,—howling, weeping, and so on, that the soul of the dead man be not grieved by neglect. If the deceased bore the name of a thing or animal, the name is no longer used, which causes some confusion in the language.

They know very little of fishing. Even the salmon are taken with a spear. Their weapons are arrows, lances, and harpoons, pointed with bone or iron. The latter is obtained by traffic with the southern natives, or from wreckage. They make knives and needles of it, as well as arrow-points. Needles and beads are much in request. Collars are made for dress occasions by fastening fish vertebrae on strips of dressed intestine, as on a ribbon. They are very ingenious in wood-carving, and their wooden articles are ornamented with inlaid bits of white bone or stone. They carve representations of parts of the coast in wood; and among the articles brought home by Lieutenant Holm was a collection representing, in wood, the parts of the adjacent coast. These carvings are so good, that the members of the expedition recognized from one of them an island which they had not previously seen. Toys are also carved with great accuracy and neatness. The children have and dress dolls, play with toy bears, sledges, etc.,—all well executed.

Fire is obtained by means of the fire-drill, and is caught on the dry moss which serves for wicks in their great stone lamps, which both heat and cook for the household.

There is a good deal of driftwood thrown on this coast. The autumn and early winter are mild, in the present case above 37° F. It was only in the month of February that the sea became ice-bound: it remained so until the end of June. In general the coast is free for navigation during

July, August, and September. The winds experienced were chiefly from the north-east.

THE POPULATION OF LONDON.

THE growth of this huge city presents a problem full of interest, says *Engineering*, and not without anxiety to those who are responsible for its government. It has already attained a population which overshadows that of every other city, both ancient and modern, and which, indeed, surpasses that of many a kingdom whose actions are now watched with concern by the leading statesmen of Europe. Scotland, Switzerland, and the Australasian colonies each contains less souls than London, while Norway, Servia, Greece, and Denmark can scarcely boast half so many. The famous cities of the world look small by comparison. Paris, Berlin, and Brussels cannot together equal the sum of its multitude, nor New York, Brooklyn, Hoboken, and Jersey City two-thirds of it. And the greater part of this aggregation of human beings has been gathered together within very recent times.

Since the commencement of the century the number of inhabitants has quadrupled, rising from 958,863 in 1801, to 3,816,483 in 1881; and the question to be answered is, how long will the attraction which London possesses for the people of the provinces and of foreign lands continue, and how long can it find accommodation for the yearly influx? When the attraction ceases, it is safe to predict the beginning of the end; for, as soon as the metropolis no longer draws to itself the best men from every part of the country, it will lose its supremacy, and other places will rival it, each being its superior in some department. But there is a sense in which London must in time become fixed, and incapable of further expansion. The area of the registration district is not likely to be extended, and consequently a time must arrive, if the growth be maintained, when it will be completely filled, and all additions must be confined to the surrounding district, the greater London, the size of which no one can foretell.

The length of time which will be occupied in filling the present metropolitan area formed one of the principal topics lately dealt with by Mr. Price-Williams in a paper on 'The population of London, 1801 to 1881,' recently read before the Statistical society. In this he traced the variation of the population in each district decade by decade, showing how many have attained a maximum, and then declined to be stationary at a point which appears to represent their permanent capability. The total area of London is 75,334 acres, or, omitting those occupied by water, 74,427 acres. Mr. Price-Williams estimates the maximum pos-

sible population within the metropolitan registration area at about 7,000,000, or about ninety-four people per acre, and that it will require thirty-six years for the density to be acquired over the entire area, assuming that the average rate of increase of population, which has obtained during the last eighty years, namely, 18.86 per cent per decade, to be maintained in the future. He points out, however, that the percentage of increase has been falling since 1851, and is now only 17.28 per cent; so that it is possible, or indeed probable, that the term of years mentioned by him may be exceeded.

Mr. Price-Williams bases his calculations on the capacity of the metropolis by observing that in all parts some area gets filled, and then in a little time the population decreases to a point which may be considered as a constant at which it will be maintained. In the districts which are completely built over, the tendency is for the population to be displaced by shops, offices, and the like; and thus it may safely be affirmed that in such parts the maximum will never be reached again. In the outlying districts there is generally some part which may be taken as fairly characteristic of the whole, and may be used as a basis for calculation.

The commencement of the marked increase coincided with the institution of the railways, which rendered it possible to persons to live at a distance and get backwards and forwards with facility. It is an interesting problem to consider how much further the system of suburban residence will be extended. Already there are signs that a part of the population is finding that it is not worth while to take a long journey to reside in a street which only differs from the street in which their business is conducted by being worse paved and lighted. The inhabitants which constitute 'society' always congregated in town, and now the rapid erection of mansions let out in flats testifies that their superior convenience and better sanitary arrangements serve as an equivalent to the fresher air of the country. If the co-operative system of housekeeping were to become general, it would greatly modify the estimate as to the possible maximum population. The average density of Paris is more than double that of London, and yet the streets are brighter and cleaner. The question probably turns more upon the prevention of smoke than upon any thing else. If the fog and gloom could be removed, and free access provided for the sunlight, there is no pleasanter or healthier place to live than the west end of London; and many who now endure, morning and evening, forty minutes' journey through choking tunnels, and walk long distances to railway termini, would stay in town if they could be relieved from the de-

pression which is the accompaniment of a murky atmosphere.

WASTE IN WHEAT-CROPS.

IN most of the wheat-producing regions of North America a yield of thirty bushels per acre is exceptional, and one of forty or more, remarkable or extraordinary. Most farmers are content to get a return of fifteen or eighteen bushels, and only twelve and one-half is the average yield throughout the United States. The usual increase is thus only about ten or twelve fold, and only very exceptionally thirty or more fold. Doubtless most persons who have given the subject any attention wonder why it is that among all farm products the return should be so small for the amount of seed sown. In a late number of the *Contemporary review*, Dr. Paley has discussed this subject, and brought out a number of interesting facts.

A single grain of wheat will produce from five to seven ear-bearing stalks : experiments seem to show that the latter is the normal number. The single blade 'spears' first into three, then into five or more side-shoots, every one of which, separated and transplanted by hand, will form a new plant. Each ear contains, on fairly good land, from fifty to sixty, sometimes even seventy, grains. Three or four of the terminal grains are generally smaller, or otherwise defective, and are rejected in winnowing and screening the wheat. But as a fair average, on a moderate estimate, a single grain can produce three hundred, and there is a possibility of four hundred, or even more. This means, of course, that every bushel sown can, theoretically at least, yield three hundred bushels ; but, as we have seen, the actual yield is only a small portion of this.

In tracing, then, the bushel sown to the twelve or fifteen bushels that come into the farmer's granary, we have to inquire what proportion of the seed germinates, how much of it is destroyed by birds, mice, insects, and how much grain is shed from over-ripeness, or lost in harvesting and threshing. A very considerable quantity, without doubt, is the aggregate loss from these causes combined. Still the immense difference between the quantity that can be, and theoretically ought to be, produced, and that which actually goes into the wheat-bin, remains to be accounted for. The loss of grain in the various processes of harvesting evidently must be much greater than is commonly supposed. If one take a ripe wheat-ear, and strike it on a table, he will see some grains fall out ; and, if he examine where a wheat-sheaf has fallen, he will find not a few kernels that have been shed. Certainly the

'volunteer' growths after harvesting are sufficient evidence of waste.

To ascertain, with something like accuracy, the actual produce of the wheat-plant, Dr. Paley planted a small piece of garden-ground, of moderate wheat-growing quality, with three separate parcels, each of fifty average wheat-grains. Of these three parcels, the first (A) was sown broadcast ; the second (B) was set in two rows, after the manner of drilled wheat ; the third (C) in separate grains six inches apart, — all carefully covered with earth. Besides these, he planted twelve grains three and a half inches deep (D), and three grains in each of three holes, one inch deep (E). Of group A, twenty-five came up, and produced one plant of three stalks, six of four, three of five, seven of seven, and three of nine, with a total of one hundred and forty-eight ear-bearing stalks ; of B, thirty plants grew, giving two of two stalks, eight of three, one of four, ten of five, six of seven, two of ten, and one of eleven, with a total of one hundred and fifty-one ; of C, thirty-two plants grew, producing a total of one hundred and forty-eight ear-bearing stalks ; of D, not a single one germinated ; and of E, only one, which did not thrive well. The nearness of the totals of the first three is remarkable. If thus we estimate an average of three stalks from each grain sown, and for each ear fifty sound grains, we should have a yield of one hundred and fifty fold.

What, then, are the reasons of such an extraordinary difference between theory and practice ? Besides the various kinds of blight, such as smut and mildew, affecting the straw or the ear, and greatly diminishing the production, there are other causes why wheat is said to thresh out badly, which are less visible while the crop is standing. One of these is the partial filling of the ear : there is more chaff than there should be in proportion to the grain. There is a popular idea about the wheat-plant which is entirely erroneous. It is thought, that, if high winds prevail while the wheat is in flower, the anthers, which are seen dangling from the ears, will be blown off, and the grain will not set through the loss of pollen. Year after year we see this stated in agricultural papers and grain reports. But the fact is, these anthers, when protruded, have already performed the office of impregnation, which takes place within the closed glumes. The 'flowers' seen hanging down are exhausted anthers, and wholly useless. The following experiments seem conclusive proof of this. Let one gather a dozen green wheat-ears from a plant that is just beginning to flower, and keep them for an hour or two in a warm room in a glass of water. The anthers may then be watched in succession in the very act of being protruded

through the tips of the glumes, which open just a little to let the thread-like filament hang out, and then close up tightly. One should then remove the ovary, with stamens and pistil, of a plant just about to flower, and, by breathing on them gently, the anthers will be seen to burst with a spasmodic motion, scattering the pollen in part upon the pistil. Immediately after the bursting of the anthers, the filament becomes restless, and begins to move. Contrary to the usual nature of this organ in plants, it is elastic; and one may watch it increasing to the length of half an inch, carrying with it, as it creeps along, the now empty and useless anthers. These observations will prove that the filament does not expand till after the discharge of the pollen, and consequently that the ovaries have been already fructified when the wheat is in flower.

This exceptional elasticity of the filament is a wonderful fact. Its purpose is to make room within the narrow seed-case for the enlarged grain by ejecting the used-up organs of the inflorescence. Occasionally, in a ripe wheat-ear, it will be found that they have not been got rid of, but lie shrivelled and crushed up within the glumes.

In social plants, which, like wheat, naturally grow best when they grow by themselves to the exclusion of others, the great law of 'the survival of the fittest' will ever be in active operation. Many feeble plants will die out, or dwindle to a stage only short of extinction, thrust out of existence by more vigorous neighbors.

The foregoing observations seem to prove that much yet remains to be studied in the habits of the wheat-plant before we shall arrive at a scientific knowledge of wheat-raising. To prepare the right soil (for too rich soil produces stalk to the loss of seed), to sow most judiciously, to withstand the injuries of mildew, insects, birds, etc., to prevent loss in harvesting or threshing,—all are problems that deserve more attention than they have received, in order that the usual yield of fifteen bushels may be increased toward the possible one hundred and fifty.

POISONOUS MUSSELS FROM IMPURE WATERS.

THE not infrequent occurrence of poisoning from eating mussels makes the discovery of any facts concerning the causation of such poisonous qualities a subject of special interest. In the following, gathered from several recent German publications, it appears that impure waters will produce such effects, and hence it impresses the necessity of careful sewerage regulations upon such seaport cities where food-supplies are de-

rived more or less from the immediately adjacent waters.

In Wilhelmshaven, a city of north Germany, a few months ago, a large number of people were suddenly taken sick after having eaten of the common edible mussel of Europe and North America (*Mytilus edulis*), obtained from the harbor. Several thus poisoned died from the effects, in one case within a few hours.

The subject has attracted much attention throughout Germany, both from the public and a number of scientific men. It was ascertained later that the mussels of this harbor, when transferred to other waters, lost their poisonous nature; and, *vice versa*, harmless mussels, placed in the harbor, in a week or two acquired poisonous qualities. From the report by Professor Möbius, of his researches upon the subject, it appears that the basin or harbor of Wilhelmshaven is closed in by a breakwater, so that the water becomes stagnant and unfreshened by the tides, the breakwater only being opened at high tides to allow the entrance of ships. The sewerage of the city is not discharged into the harbor, but into the open sea, and all ships are prohibited from throwing matter into the water that could cause pollution; nevertheless the stagnating water, as will be seen, is impure, and highly dangerous in its effects upon animal life. The only fishes that live in the harbor are eels and whiting. Others that find entrance at the opening of the sluice-gates soon lose their activity, and can be easily caught in the hand; even the eels in summer are observed in a weakened condition swimming sluggishly near the surface.

Numerous and repeated experiments showed that the mussels, when freshly taken from the water and cooked, possessed a most virulent poison, killing rabbits in from two to ten minutes. It was also shown that these mussels, taken from situations where the currents of outside water entered, were not at all poisonous. Hence it is evident that the water of the harbor contains qualities that render the mussels poisonous without appearing to injure them.

The researches of Professor Virchow and Dr. Wolff have shown that the poisonous nature was not due to decomposition. The mussels, when freshly taken from the water, gave no external signs of disease. From the extended studies of the latter author, however, as given in the last number of Virchow's *Archiv*, it appears that all portions of the body were inert except the liver, and that in every case rabbits and guinea-pigs inoculated with a portion of this organ died in from two to twenty minutes. The liver is a large, yellowish brown, soft body, enclosing the

stomach on the upper side, and involved in numerous loops of the intestine. There seems to be no doubt that the poison lay in this part exclusively. Changes of size, color, and fatty degeneration were affirmed by Coldstream to exist in the liver when of a poisonous nature, but Dr. Wolff says that none of these changes are sufficiently constant to base a positive decision upon them. The last-named writer does not believe that the poison is due to any foreign substance, such as copper, etc., in the organ, but that it originates there. Virchow has shown the resemblance between the action of this poison and that from fishes, which not seldom occurs; and it is not at all improbable that many cases of the latter are due to the ingestion of the liver.

The symptoms of the mussel-poisoning were of three different kinds, — exanthematous (dermal eruptions), choleraic, and paralytic. On rabbits, experiments only produced paralysis and loss of power, with increasing difficulty in respiration, ending in death.

It is difficult, if not impossible, to determine in any given case whether a mussel is dangerous or not; and Dr. Wolff, therefore, advises that this food should be avoided as much as possible, at least when one does not know whence it is obtained. Under all circumstances the liver should not be eaten. It has further been ascertained, however, that the poison is rendered inert by cooking the shell-fish in a solution of soda.

NEW BOOKS.

'WATER-METERS,' by R. E. Browne (New York, *Van Nostrand*), is one of the well-known science series, and gives a description of certain mechanical devices. The book will be of service to hydraulic engineers. — 'The preservation of timber by the use of antiseptics,' by S. B. Bolton (New York, *Van Nostrand*), is another of the series, and contains a reprint of a paper read before the English institution of civil engineers. — 'Rameses the Great,' from the French of F. De Lanoye (New York, *Scribner*), is a history of Egypt thirty-three hundred years ago, and attempts to picture Egyptian life of that date. — 'The phenomena and laws of heat,' by A. Cazin (New York, *Scribner*), is a popular account of the modern theory of heat, based upon experimental results. The author avoids referring to heat as a mode of motion, or trying to give any conception of what its ultimate nature may be. — 'The intelligence of animals,' by E. Menault (New York, *Scribner*), contains descriptions of the intellectual manifestations displayed among various insects, fishes, reptiles, birds, and mammals, interspersed with numerous anecdotes of their intelligence.

It contains a number of illustrations of varying excellency, and will be of more especial interest to a younger class of readers. — 'A farmer's view of a protective tariff,' by Isaac W. Griscom (Woodbury, N.J., *The author*), is a farmer's plea for free trade. It is written in a more sober and judicious spirit than characterizes many of the pamphlets belonging to the tariff discussion. He denies that the agriculturist is getting any more for his products than before the civil war. No system of protection can have much influence upon the prices of those staples of agriculture of which the country produces more than it consumes; and the law of equalization of profits will quickly modify the prices of such crops as are supposed not to depend for their price on a distant market. — 'La photographie appliquée à l'histoire naturelle,' by M. Trutat (Paris, *Gauthier-Villars*), contains an intelligent and fresh account of the apparatus and methods for photography of natural-history objects, illustrated with fifty-eight woodcuts. A number of phototype plates are given, showing both the excellences and defects of photography for the production of natural-history figures. The work lacks conciseness, and contains considerable matter in zoölogy and botany not germane to the subject under consideration. The author, also, is rather too strongly prejudiced in favor of the merits of photography to be an altogether safe guide. — 'Chemical tables for schools and science classes,' by A. H. Scott-White (New York, *Scribner & Welford*), purports to be a text-book for examinations in which a knowledge of elementary analysis is required. The book is the outgrowth of the difficulty found by the author in having notes satisfactorily taken.

THE German quinquennial census, on the 1st of December last, so far as the published returns reach, gives a decided increase of the city populations. Berlin, especially, shows an unexpected growth. This city, which now numbers 1,316,382 inhabitants, ranks as the third European city in size; and this does not include the close-lying suburbs. Since 1880 the increase has been over sixteen per cent, and within twenty years the city has doubled in size. A few of the other more important cities show the following populations: Breslau, 298,893, an increase of 15,981; Munich, 260,005, with 30,082 increase; Dresden, 245,550, with 24,732; Leipzig, 170,076, with 20,995; Frankfurt, 153,765, with 17,934. Some of the middle German towns have grown remarkably, not a few showing an increase of from twenty to forty per cent. Only a single city has fallen off in population, Aushach, which has a loss of 0.15 per cent.